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A Decade of *Begonia* (Begoniaceae) from Sarawak, Borneo

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Summary. Ten new species of *Begonia*, *B. bakunensis* S. Julia, *B. belagaensis* S. Julia, *B. bengohensis* S. Julia, *B. flavovirens* Kiew & S. Julia, *B. jugamensis* S. Julia & Kiew, *B. lambirensis* Kiew & S. Julia, *B. linauensis* S. Julia, *B. roseopunctata* Kiew, *B. setiamensis* S. Julia & Kiew and *B. sirukitii* S. Julia & C.Y. Ling, are described from Sarawak based on collections accumulated over a decade. All species have very narrow distributions with six known only from a single locality while others are known only from 2–5 localities. All species belong to the section *Petermannia*. Descriptions and colour photographs are provided for all species as well as a distribution map for all species.

Study of *Begonia* diversity in Borneo continues to reveal an astonishing number of new species as areas previously not explored botanically are visited. In Sarawak, only begonias associated with limestone hills have been the focus of study (Kiew, 2001; Pearce, 2003; Kiew & Geri, 2003; Kiew & Julia, 2007; Kiew & Julia, 2009; Julia *et al.,* 2013), resulting in the enumeration of 31 species, many confined to a single hill or group of hills. In general, this appears to be the pattern of distribution for Bornean begonias where very few species are widely distributed.

The impetus for this study comes from the preparation of the Guide to Begonias of Borneo, which drew attention to many attractive and interesting species that had not previously been

described and named. One focus of our study has been the documentation of *Begonia* in national parks. These begonias are among species that are most accessible to the general public but surprisingly many remain undescribed and without a name. Another focus has been the programmes by Sarawak Forestry to document plants from areas that will be flooded by hydroelectric dams, most recently at Bakun, Bengoh and Murum (Pascal *et al*., 2014). In other areas, as a result of on-going landuse changes, begonias that are restricted to primary forest are vulnerable to disturbance, both from exposure following the opening of the canopy or from siltation and flooding of rocky streams, where they often grow. The forest of Bukit Setiam, Tatau District, is an extreme example of this. Part of the area has already been converted to oil palm plantations, the rest has been severely disturbed by logging where bulldozing the soft mudstone has obliterated smaller streams and caused massive siltation of the main river. Begonias now only survive on a few vertical rock faces. Wildlife corridors can be a refuge for *Begonia* species, as is seen in the Bukit Mina Wildlife Corridor area, Tatau District, where streams protected by a broad forest margin still harbour pristine vegetation and where begonias can survive. This latter illustrates the importance of planning wildlife corridors and implementing their integrity as areas are cleared for plantations.

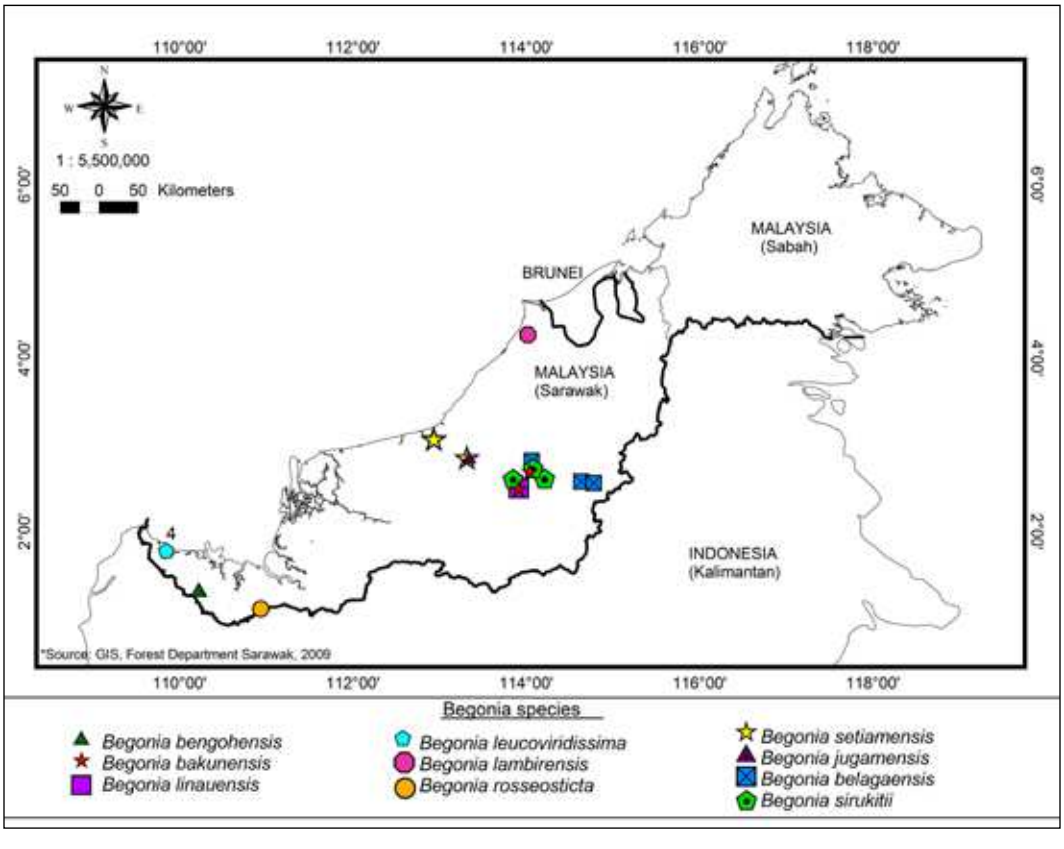

Fig. 1. Distribution of the ten species in Sarawak.

Materials and Methods

This study is based on herbarium collections made over a decade and deposited in the Sarawak Herbarium (SAR). All collections are from fieldwork by various staff of Sarawak Forestry and SAR, as well as the living collections in the nursery at the Semengoh Nature Reserve (NR), Kuching. All species descriptions are based on living material, unless otherwise specified.

Results

In this paper, ten new species are described and all are illustrated by colour photographs of living plants. All the species described here belong to section *Petermannia*. Based on current knowledge, most species have narrow distributions (Fig. 1).

Taxonomy Treatment

1. Begonia bakunensis S. Julia **sp. nov.**

This species is distinct in its semi-orbicular glandular bracts and bracteoles. Similar to *Begonia bahakensis* Sands (1997: 432) in its creeping or wiry habit, hispid petioles and broadly ovate lamina; it is different in having larger stipules, 7–12 × 6 mm, apex setose with seta to 5 mm long (vs. smaller stipules, *ca*. 5 × 3 mm, apex setose with seta to 2 mm long in *B*. *bahakensis*), longer lamina, 8–10 cm long (vs. 5.5–7.8 cm long), the narrow side 3.5–4.5 cm wide (vs. narrow side 1–2.5 cm wide), the basal lobes 1.5–2.5 cm long (vs. basal lobes 1 cm long, the base cordate and overlapping (vs. cordate but not overlapping), fruit pedicels shorter, 15–18 mm long (vs. 22–27 mm long) and the capsules wider, 1.5–1.7 cm (vs. narrower, 1.0–1.2 cm) with wings 4–5 mm wide, rounded distally and broadly acute proximally (vs. 3–5 mm wide, narrowed distally and proximally). Type: *Julia et al*. *SFC 575*, Borneo, Sarawak, Belaga District, Bakun, Sungai Linau, 13 October 2009 (holotype SAR!). **(Fig. 2)**

Creeping begonia, to 80 cm long. Stems 4–8 mm thick, red or reddish brown, densely covered with red hispid hairs, 3–4 mm long, much branched, slightly succulent, internodes 3.5–7.5 cm long, slightly thickened at nodes. Stipules brownish or greenish, densely hispid, ovate, 7–12 × 5–6 mm, keeled, margin entire, apex setose, seta to 5 mm long, persistent. Leaves alternate, distant, held horizontally, oblique; petioles red, densely covered with red hispid hairs, 5–10.5 cm long, terete; lamina plain pale green above, paler below, in life fleshy, glossy, broadly ovate, 8–10 × 6.5–8.5 cm, asymmetric, narrow side 3.5–4.5 cm wide, base cordate, overlapping, basal lobes 1.5–2.5 cm long, margin almost entire with minute teeth, apex acuminate, acumen to 1.5 cm long; venation palmate, veins red at the base, otherwise green, 2 veins on either side of the midrib, 3–4 veins in basal lobe, glabrous, impressed above, prominent beneath. Inflorescences protogynous, female flower single or

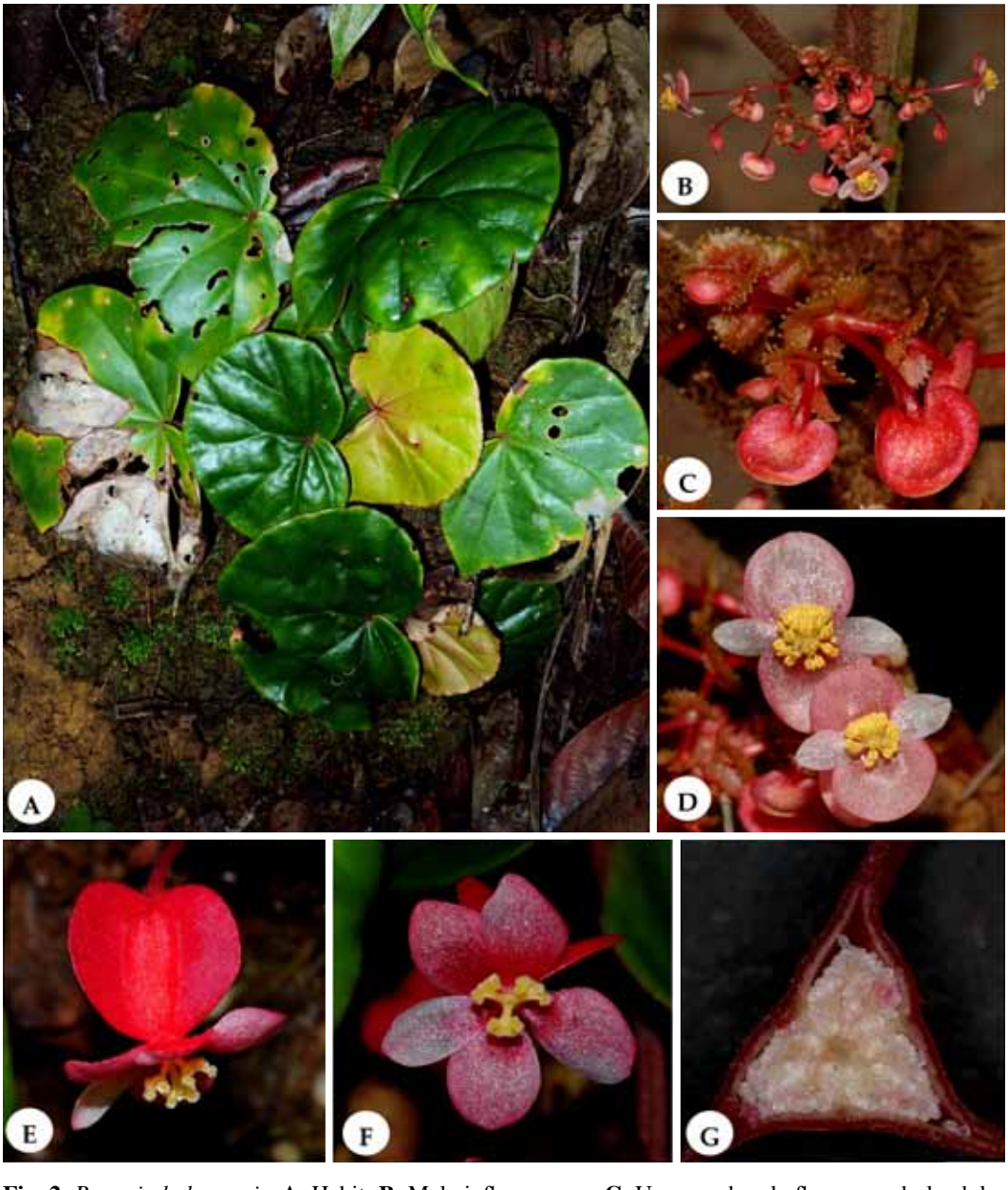

Fig. 2. *Begonia bakunensis*. **A.** Habit; **B.** Male inflorescence; **C.** Unopened male flowers and glandular bracts and bracteoles; **D.** Male flowers; **E** & **F.** Female flower; **G.** Cross-section of ovary. Photo **A** from *SFC 719* by Ling Chea Yiing; Photos **B**–**D** from *Linau 1-81* by Ong Poh Teck; Photos **E** & **F** from *Linau 1-81* by Ling Chea Yiing; Photo **G** from *Linau 1-81* by Julia Sang.

in pairs on the lower part of the stem; male inflorescences axillary, producing one to several cymes of male flowers, 2.5–4 cm long. Bracts pinkish red, reniform, 5–6 × 4–5 mm, margin entire with stalked glands, glabrous, persistent. Bracteoles similar shape but smaller. Male flowers: pedicel crimson, 4–6 mm long; tepals 4, glabrous, outer 2 tepals rotund, 4–6 × 5–6 mm, outside crimson, inside pale red, inner 2 tepals pinkish, narrowly elliptic, *ca*. 3 × 1 mm; stamens 28–30, yellow, cluster globose, torus short; filaments yellow, 1–2 mm long; anthers yellow, obovate, *ca*. 1 × 0.4 mm, apex emarginate. Female flowers: pedicel crimson, 1.3–1.8 cm long, glabrous; ovary crimson, ovoid, 0.8–1.4 × 1–1.5 cm, wings 3, more or less equal, locules 3, placentas bilamellate; tepals 5, crimson, glabrous, margin entire, outer 4 tepals more or less isomorphic, elliptic, *ca*. 10 × 4 mm, apex broadly acute or almost rounded, the innermost ones narrowly elliptic, *ca*. 9 × 4 mm, apex acute; styles 3, lemon yellow, *ca*. 2 mm long, divided to base, deeply Y-shaped; stigma lemon yellow, papillose forming a continuous twisted band. Capsules rotund, 1.2–1.5 × 1.5–1.7 cm, glabrous, locules 3, wings 3, sub-equal, rounded proximally, broadly acute distally, 4–5 mm wide, thinly fibrous, dehiscing between the locule and wing, pendent on pedicels 15–18 mm long. Seeds barrel-shaped, *ca*. 0.3 × 0.1 mm, columnar cells more than half the seed length.

ETYMOLOGY. Named for Bakun where the specimens were collected.

ECOLOGY. On very rocky steep slopes covered with thick leaf litter or in shaded areas on steep slopes in mixed dipterocarp forest at 168 m elevation.

DISTRIBUTION. Borneo. Endemic to Sarawak (Bakun area in Belaga District).

SPECIMENS EXAMINED—BORNEO. SARAWAK: Belaga District: Bakun Dam — Linau, Sungai Iban, *Lee, BS 45550* (SAR); Sungai Linau, *Julia et al. SFC 575* (holotype SAR!); Ulu Sungai Linau, Giam Talang, *Ling et al. SFC 2273* (SAR); Sungai Linau, Bukit Anyob, *Julia et al. Linau 1-81* (SAR); Ulu Sungai Linau, Wong Talang, *Rantai et al. SFC 719* (SAR); Balupeh, *Julia S 97238* (SAR).

2. Begonia belagaensis S. Julia **sp. nov.**

Similar to *Begonia propinqua* Ridley (1906: 249) in its bushy habit and very oblique and asymmetric leaves; however the species is different in having a succulent and thicker stem, 10–12 mm thick (vs. 6 mm thick in *B. propinqua*), wider stipules, 10–12 mm wide (vs. 6–8 mm wide), shorter petioles, 4–5 cm long (vs. 7.5–16 cm long), inflorescence bracts with glandular margins (vs. entire margin), longer female flower pedicel, *ca*. 2.5 cm long (vs. 0.6–1 cm long), longer fruit pedicel, 1–2.5 cm long (vs. 0.8–1 cm long), larger fruit, 1.5–1.8 × 1.4–1.5 cm (vs. 1–1.5 × 0.8–1.5 cm) and wider fruit wings, 5–6 mm wide (vs. 3–4 mm wide). Type: *Ling et al., BMHEP 3821*, Borneo, Sarawak, Belaga District, Sungai Chak (tributary of Sungai Murum), 20 March 2014 (holotype SAR!). **(Fig. 3)**

Semi-erect begonia, to 30–50 cm tall, bushy and forming large clumps. Stems little-branched, pale green, 1–1.2 cm thick, glabrous, very succulent, internodes 3–6.5 cm long, slightly thicker at nodes. Stipules pale green glabrous, broadly ovate, 2.3–2.5 × 1–1.2 cm, keeled,

Fig. 3. *Begonia belagaensis*. **A** & **B.** Habit; **C.** Glandular bracts and bracteoles; **D.** Male flower; **E.** Male flowers; **F** & **G.** Female flower; **H.** Fruits on pendent pedicel. All photos from *CMHEP 4785* by Ling Chea Yiing.

margin entire, apex acute, persistent. Leaves alternate, distant, held horizontally, oblique, held vertically; petioles pale green, glabrous, 4–5 cm long, fleshy, *ca*. 6 mm thick, grooved above; lamina plain green, paler below, in life succulent and thick, glossy, asymmetric, broadly ovate, 12–12.5 × 11.5–12 cm, narrow side *ca*. 4 cm wide, base cordate, overlapping, basal lobes 1.5–2 cm long, margin minutely serrate, apex acuminate, acumen to 1 cm long; venation palmate-pinnate, 2–3 veins on either side of the midrib, twice branching, 3–4 veins in basal lobe, concolorous, glabrous, prominent on both surfaces, more so below. Inflorescences protogynous, axillary in upper leaf axils, glabrous, paniculate, peduncle *ca*. 4 cm long, rachis 14–30 cm long, 1–2 female flowers at the base, many male flowers on the upper rachis. Bracts pale green, broadly ovate, 18–22 × 7–10 mm, keeled, margin glandular, apex setose, seta *ca*. 2 mm long, caducous. Bracteoles pale green, orbicular, 6–7 × 5–6 cm, margin glandular. Male flowers: pedicel reddish, 5–12(–20)–13 mm long; tepals 4, pale green, reddish towards the base, glabrous, margin entire, apex acute, outer 2 tepals broadly oval, 4–6 × 5–6 mm; inner 2 tepals lanceolate, 2–5 × 1–2 mm; stamens 42–45, cluster conical, sessile; filaments lemon yellow, *ca*. 0.8 mm long; anthers lemon yellow, obovoid, 0.6–0.8 × 0.4 mm, apex emarginate. Female flowers: pedicel greenish or reddish, *ca*. 2.5 cm long, glabrous; ovary pale green or reddish tinged green, obovate, *ca*. 1.7 × 1.3–1.5 cm, wings 3, subequal, locules 3, placentas bilamellate; tepals 5, completely greenish or greenish at the apex, pinkish toward the base, outer 4 tepals elliptic, *ca*. 10–12 × 6–8 mm, margin entire, apex acute, innermost tepal linear or narrowly elliptic, *ca*. 8 × 2–5 mm; styles 3, lemon yellow, 2–3 mm long, divided to base, widely Y-shaped; stigma lemon yellow, papillose forming a continuous twisted band. Capsules single on the lower part of the rachis, completely green or reddish-green, 1.5–1.8 × 1.4–1.5, glabrous, locules 3, wing 3, subequal, rounded at both ends, 5–6 mm wide, thinly fibrous, dehiscing between the locule and wing, pendant on pedicels greenish or reddish, 1–2.5 cm long. Seeds barrel-shaped, *ca*. 0.3 × 0.2 mm, columnar cells more than half the seed length.

ETYMOLOGY. Named for the Belaga District where the species was collected.

ECOLOGY. Riparian forest in semi-shaded areas at 540–560 m elevation.

DISTRIBUTION. Borneo. Endemic to Sarawak (Bakun and Murum area in Belaga District).

SPECIMENS EXAMINED—BORNEO. SARAWAK: Belaga District: Murum Dam — Sungai Danum, *Peter et al. BMHEP 4134* (SAR); Sungai Teba (tributary of Sg. Danum), *Peter et al. BMHEP 4123* (SAR); Sungai Muat, *Vilma et al. CMHEP 4785* (SAR); Sungai Nawang (tributary of Sungai Danum), *Jacqualine et al. BMHEP 5843* (SAR); Bakun Dam — Sungai Balui, *Ling et al. SFC 1301* (SAR), *SFC 1302* (SAR); Sungai Chak (tributary of Sungai Murum), *Ling et al. BMHEP 3821* (holotype SAR).

NOTES. Widespread in the Bakun Dam and Murum Dam area where the species still can be found above the inundated areas.

3. Begonia bengohensis S. Julia **sp. nov.**

Similar to *Begonia malachosticta* Sands (1990: 61) in its white spotted leaves but the species is different in its shorter stipules, *ca*. 13 mm long (vs. 17–22 mm long in *B. malachosticta*), length to width ratio of the lamina <3:1 (vs. 3–6:1), longer paniculate inflorescences, 9–20 cm long (vs. inflorescences cymose and not more than 4 cm long), larger bracts, 3–4 × 2 mm (vs. 0.75–1.5 × 0.5–0.75 mm), shorter pedicels of female flowers, *ca*. 8 mm long (vs. 13–25 mm long), fewer stamens, 30–40 (vs. 75–85) and broader outer tepals of female flowers, 9 × 5–6 mm (vs. 10–14 × 6–8 mm). Type: *Ling et al., SFC 1814*, Borneo, Sarawak, Kuching District, Padawan, Sungai Bengoh, 24 June 2010 (holotype SAR!). **(Fig. 4)**

Cane-like begonia, to 1.5 m tall. Stems erect and much-branched, reddish brown, slightly woody, 3–5 mm diameter, glabrescent, internodes 4–7 cm long, inconspicuously thicker at nodes. Stipules pale green, glabrous, lanceolate, *ca*. 13 × 4 mm, margin entire, apex setose, seta to 3 mm long, persistent. Leaves alternate, distant, held horizontally to slightly pointing downwards, oblique; petioles reddish brown, glabrescent, (2.8–)3–5 cm long, grooved above; lamina dark green above, paler below or purplish below on young leaves, plain or variegated above with irregular white patches between the veins on upper surface, in life bullate, coriaceous, glossy, ovate to triangular, asymmetric, 10–15.5 × 4–8 cm, the narrow side 1.8–2.5 cm wide, base cordate, basal lobes 0.8–1.2 cm long, margin minutely dentate, wavy, apex strongly acuminate, acumen to 3 cm long; venation palmate-pinnate, 2–3 veins on either side of the midrib, 3–4 veins in basal lobe, reddish brown, glabrous, strongly impressed above, prominent beneath. Inflorescences protogynous, axillary in upper leaf axils, paniculate, peduncle 4.5–6 cm long, rachis 9–20 cm long, with 1–2 female flowers and many male flowers. Bracts greenish, linear, 3–4 × 2 mm, entire, caducous. Bracteoles same shape as bracts but smaller. Male flowers: pedicel reddish or pinkish, 5–7 mm long; tepals 4, glabrous, margin entire, apex acute or rounded, outer 2 tepals pale green to yellowish green, oval, 3–5 × 4–5 mm; inner 2 tepals greenish or yellowish green, elliptic, 3–4 × 2 mm; stamens 30–40, cluster globose, sessile; filaments pale yellow, *ca*. 1 mm long; anthers pale yellow, obovoid, 1–1.6 × 1 mm, apex emarginate. Female flowers: pedicel pale pink or greenish, *ca*. 8 mm long, glabrescent; ovary greenish yellow, oblong or rotund, *ca*. 13 × 10 mm, wings 3, equal, locules 3, placentas bilamellate; tepals 5, yellowish green, margin entire, apex acute, 4 outer tepals ovate or elliptic, *ca*. 9 × 5–6 mm, the innermost ones smaller, lanceolate, *ca*. 8 × 2 mm; styles 3, pale yellow to pale brown, *ca*. 2 mm long, divided to base; stigma pale yellow or brownish, widely Y-shaped, papillose forming a continuous twisted band. Capsules ellipsoid or rotund, 1.7–2.2 × 1–1.5 cm, glabrous, locule 3, wings unequal, slightly rounded proximally, acute distally, 4–5 mm wide, thinly fibrous, dehiscing between the locules and wings, pendent on pedicels to 1.5–2 cm long, *ca*. 1 mm thick when dry. Seeds barrel-shaped, *ca*. 0.3 × 0.2 mm, columnar cells more than half the seed length.

ETYMOLOGY. Named for Sungai Bengoh where the type specimen was collected.

ECOLOGY. Shaded areas along rivers in lowland forest below 100 m elevation.

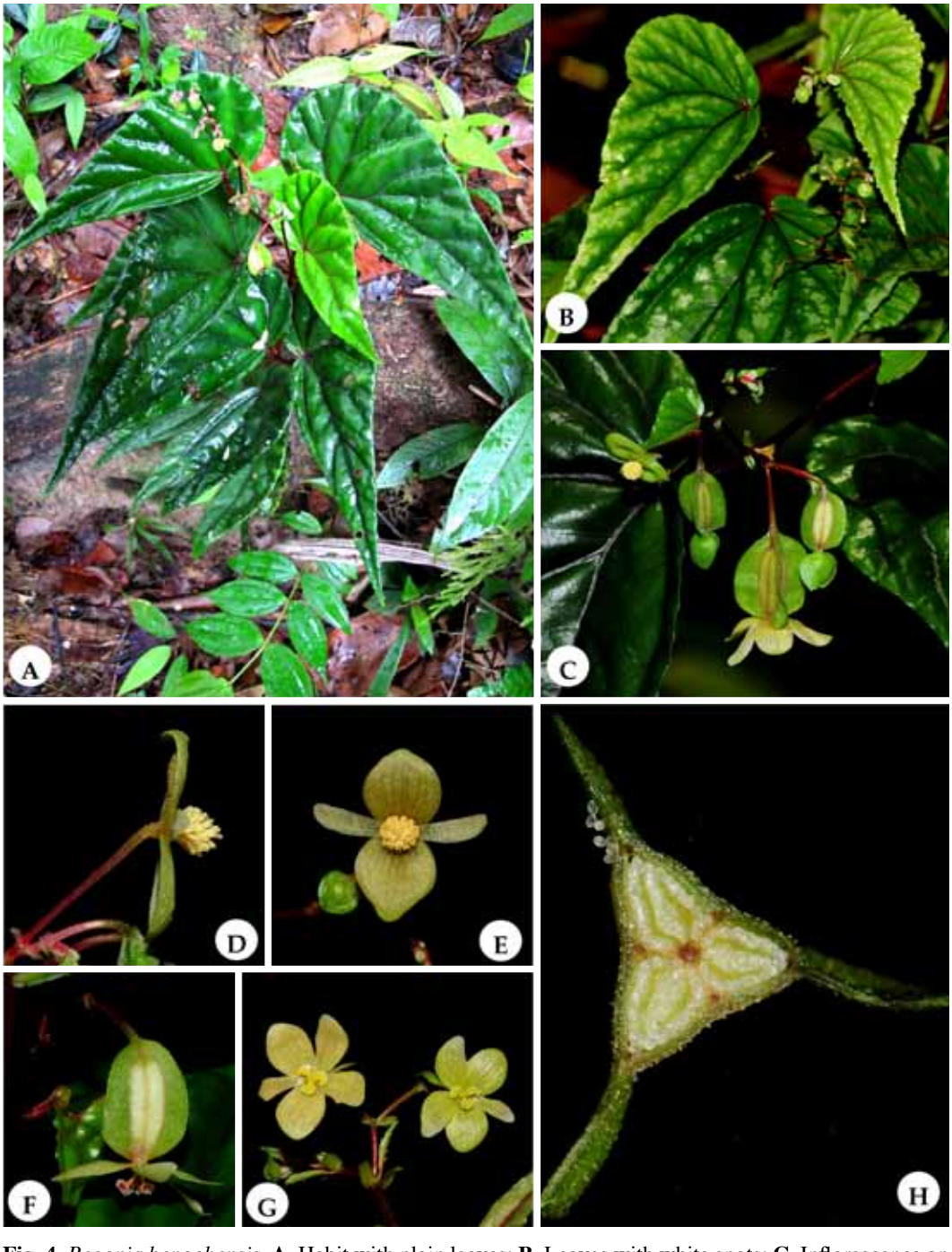

Fig. 4. *Begonia bengohensis*. **A.** Habit with plain leaves; **B.** Leaves with white spots; **C.** Inflorescence on upper leaf axil; **D** & **E.** Male flower; **F** & **G.** Female flowers; **H.** Cross-section of ovary showing 3 locules with 2 placentas each. All photos from *SFC 1814* by Ling Chea Yiing.

DISTRIBUTION. Borneo. Endemic to Sarawak (Padawan).

SPECIMENS EXAMINED—BORNEO. SARAWAK: Kuching District: Padawan — Sungai Bengoh, *Ling et al. SFC 1814* (holotype SAR!); Bengoh Dam site, along the trail to Kampung Sait, *Ling et al. SFC 1613* (SAR).

NOTES. Living plants are currently grown in the *ex-situ* conservation collection in Semengoh NR.

4. Begonia flavovirens Kiew & S. Julia **sp. nov.**

Similar to *Begonia lailana* Kiew & Geri (2003: 117) in its habit and size of the stipule but it is different in its less robust stem and leaves, basal lobes 2.5–4 mm long (vs. 5–10 mm long in *B. lailana*), 5–6 veins on either side of the midrib (not 3), its inflorescences less branched with fewer male flowers and female tepals with entire margin (vs. toothed margin). Type: *Julia & Kiew SFC 3415,* Borneo, Sarawak, Lundu district, Gunung Gading National Park, main trail to Waterfall 2, 16 May 2014 (holotype SAR!). **(Fig. 5)**

Cane-like begonia, to 1.5 m tall. Stems 4–6 mm thick, reddish brown with adpressed pubescence; internodes 3–9.5 cm long, swollen at the nodes. Stipules pale green, lanceolate, *ca.* 2 × 0.7 cm, keeled outside, keel covered with long adpressed red hairs, apex setose, seta *ca.* 6 mm long, caducous. Leaves alternate, distant, tip pointing downward at an angle *ca.* 30°, not oblique; petioles reddish brown with adpressed pubescence, 8–13 mm long, slightly grooved above; lamina plain yellowish green above, pale green below, in life coriaceous, matt, asymmetric, slightly obovate, 11–18 × 5.5–9 cm, broad side 3.5–5.5 cm wide, base very unequal, slightly acute, basal lobes 2.5–4 mm long, margin finely serrate, apex acuminate, acumen 1–1.5 cm long; venation pinnate, 5–6 veins on either side of the midrib, a pair of vein in basal lobe, usually red below and at the base of the veins above, adpressed red hairs, midrib and base of the secondary veins slightly raised above (sometimes appearing slightly bullate), otherwise impressed, prominent beneath. Inflorescences protogynous, in the upper leaf axils, cymose, glabrous; peduncle 3.5–5.5 cm long, rachis to 5.5 cm long, very slender, *ca.* 1 mm thick, held horizontally, with a single female flower and 2–5 male flowers spaced 1–1.5 cm apart. Bracts and bracteoles similar to stipules but smaller in size, narrowly lanceolate, 4–8 mm long, margin entire, persistent. Male flowers: pedicel pale green, 3–5 mm long; tepals 2, very rarely 4, outside whitish green or white with long red hairs, inside greenish white, glabrous, broadly ovate, 5–7 × 6–7 mm, base slightly cordate, margin entire, apex rounded; stamens 20–35, pale yellow, cluster conical; filaments pale yellow, *ca.* 0.6 mm long; anthers pale yellow, obovoid, *ca.* 0.5 × 0.4 mm, apex emarginate. Female flowers: pedicel pale red, 3–7 mm, with sparse long hairs; ovary whitish green, ovoid, 1.2–1.5 × 1.2–1.5 mm, narrow to the base; tepals 5, outer 4 tepals completely isomorphic, broadly oval, *ca.* 7 × 4–5 mm, apex slightly acute; the fifth tepal narrower, *ca.* 7 × 4 mm; wings 3, equal, locules 3, placenta bilamellate; styles 3, pale yellow, *ca.* 3 mm long, divided to base;

stigma pale yellow, Y-shaped, papillose forming a continuous twisted band. Capsules on the lower part of the rachis, (1–)1.6–2.4 × (1–)1.3–1.9 cm, glabrous, locules 3, wings 3, equal, rounded proximally, expanding towards the apex, not projecting beyond the stigma, 3–7 mm wide, thin, dehiscing between the locules and wings, pedicel recurved and holding the capsules horizontally underneath the lamina, (5–)8–12 mm long, stiff. Seeds barrel-shaped, *ca*. 0.3 × 0.2 mm, collar cells half the seed length.

ETYMOLOGY. Latin, *flavovirens* = yellowish green, in reference to the colour of the foliage, its yellowish green foliage making it stand out against the duller green of the surrounding vegetation.

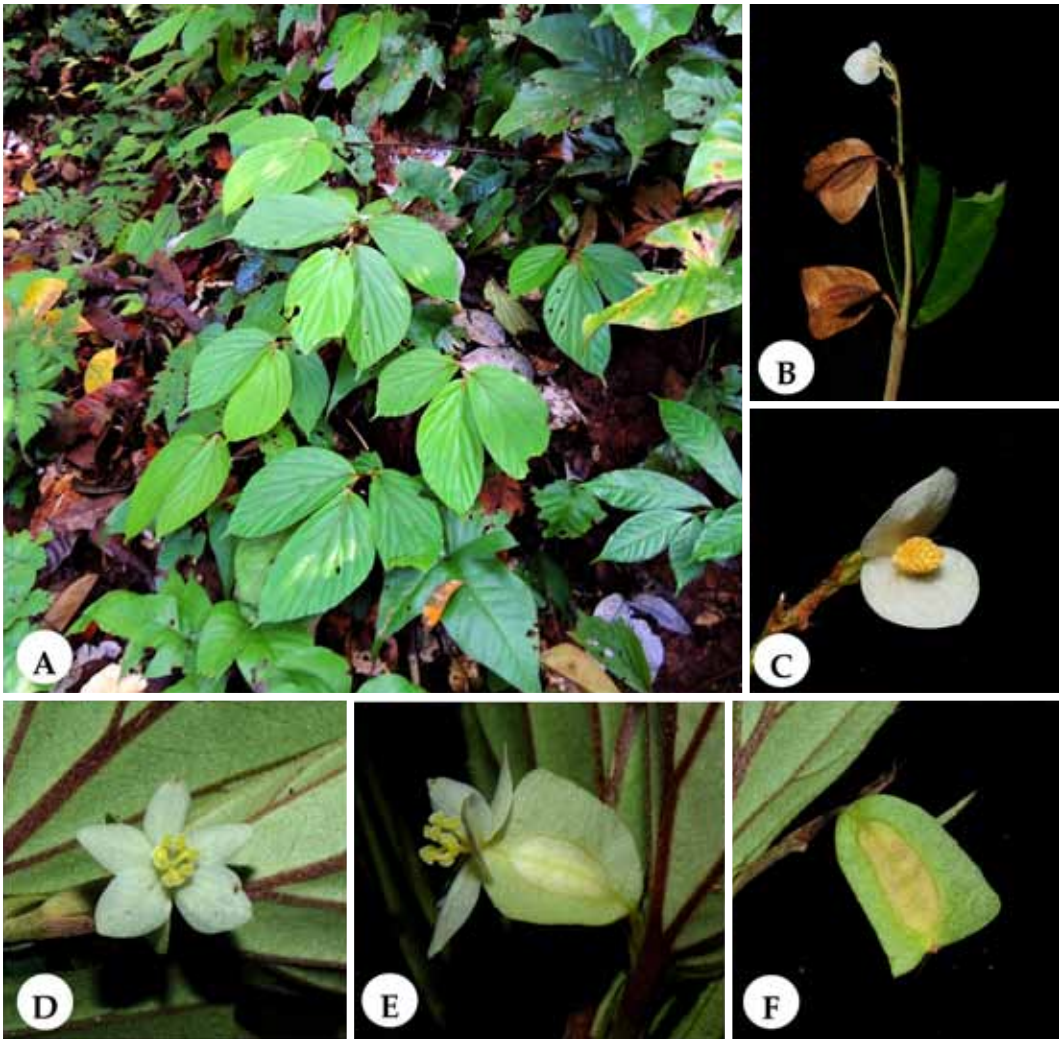

Fig. 5. *Begonia flavovirens*. **A.** Habit; **B.** Protogynous inflorescence showing old fruits and male flower; **C.** Opened male flower; **D** & **E.** Female flower; **F.** Fruit. All photos from *SFC 3415* by Julia Sang.

ECOLOGY. On steep earth banks in lowland mixed dipterocarp forest with thin vegetation, at 200–350 m elevation.

DISTRIBUTION. Borneo. Endemic to Sarawak (Gunung Gading National Park, Lundu District).

SPECIMEN EXAMINED—BORNEO. SARAWAK: Lundu District: Gunung Gading National Park, main trail to Waterfall 2, *Julia & Kiew SFC 3415* (holotype SAR!).

NOTES. The species is so far known only from the type specimen. It occurs in a totally protected area.

5. Begonia jugamensis S. Julia & Kiew **sp. nov.**

Similar to *Begonia hullettii* Ridley (1906: 255) in its habit and narrowly lanceolate, non-oblique leaves with short petioles but it differs in its longer leaves, 16–25 cm (vs. 8–14 cm as in *B. hullettii*), longer petioles, 12–33 mm long (vs. 5–8 mm long), stalked male flowers with 4 tepals (vs. sessile with 2 tepals), capsule pedicel, 9–15 mm long (not sessile) and capsules as long as wide, 10–15 × 10–15 mm (vs. shorter but wider, 5–7 × 15–20 mm as in *B. hullettii*). Type: *Julia et al. SFC 4234*, Borneo, Sarawak, Tatau District, Bukit Mina Wildlife Corridor, Bukit Jugam, 15 July 2014 (holotype SAR!). **(Fig. 6)**

Erect begonia to 22 cm long, flowering at *ca.* 7 cm tall, becoming decumbent and rooting at nodes, prostrate stem 22–47 cm long, *ca.* 9 mm thick. Erect stems deep red at the apex, green towards the base, *ca.* 8 mm diameter, sparsely hispid at the apex, becoming glabrescent towards the base; internodes 0.7–5 cm long, succulent and slightly thicker at nodes. Stipules deep magenta, sparsely hispid, narrowly lanceolate, 13–15 × 3–4 mm, margin entire, apex setose, seta 1.5–2 mm long, persistent. Leaves alternate, slightly downward pointing, not oblique; petioles deep red, sparsely hispid, 1.2–3.3 × 0.2–0.4 cm, succulent, grooved above; lamina plain mid-green above, whitish green below, young leaves sometimes tinged reddish, usually with *ca.* 2 mm long red bristles on the upper surface, sometimes completely glabrous, in life thinly succulent, matt, slightly asymmetric, slightly falcate, 16–25 × 3.3–4 cm, broad side 2–2.5 cm wide, base rounded, almost equal, basal lobes 2–3 mm long, margin minutely dentate and deeply serrate at the veins ending, apex acuminate, acumen 1.5–2 cm long; venation pinnate, 4(–5) veins on either side of the midrib, none in the basal lobe, green on both surfaces, glabrous above, with red bristles on midrib and veins beneath, slightly impressed above, slightly prominent beneath. Inflorescences protogynous, female inflorescence single-flowered cyme, axillary in the lower leaves axils, peduncle 7–12 mm long. Bracts and bracteoles minute, less than 1 mm long; male inflorescence a simple cyme of 3–4 male flowers, glabrous, *ca.* 45° above the subtending leaves, peduncle deep red, 12–20 mm long. Bracts and bracteoles deep magenta, *ca.* 1 × 1 mm, caducous. Male flowers:

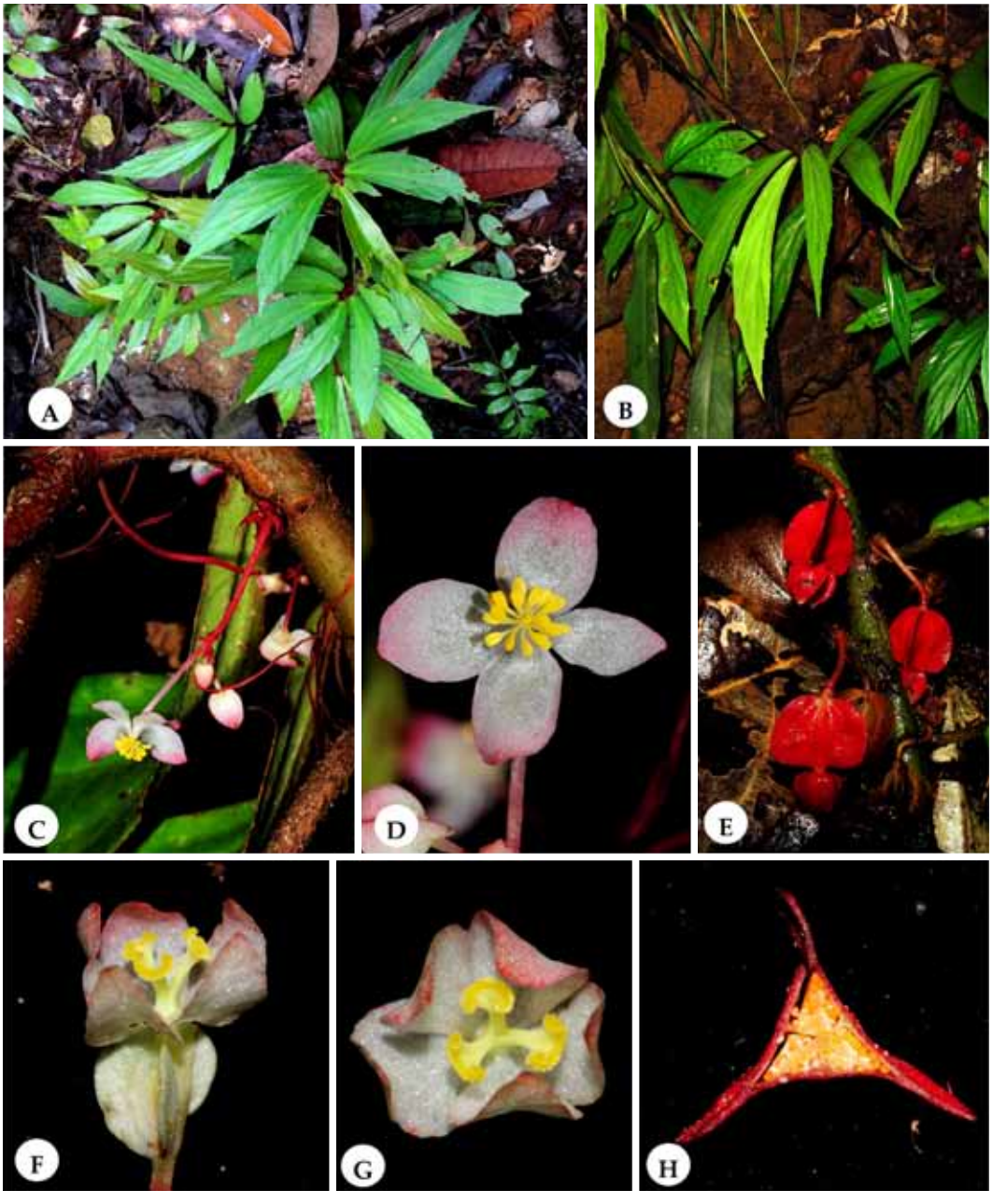

Fig. 6. *Begonia jugamensis*. **A** & **B.** Habit; **C.** Male inflorescence; **D.** Male flower; **E.** Female inflorescence; **F** & **G.** Female flowers; **H.** Cross-section of ovary. All photos from *SFC 4234* by Ling Chea Yiing.

pedicel white tinged pink, 7–13 mm long; tepals 4, white with pale pink tip, outer 2 oval with narrowed apex, *ca*. 8 × 6 mm, glabrous, margin entire; inner 2 tepals similar but slightly smaller, broadly ovate, *ca*. 7 × 6 mm; stamens 22–24, cluster globose, stalked, stalk *ca*. 1 mm long; filaments pale lemon yellow, less than 2 mm long; anthers pale lemon yellow, obovate, *ca*. 1 × 0.8 mm, apex emarginate. Female flowers: pedicel magenta, 10–15 mm long, less than 1 mm thick, glabrous; ovary magenta, broadly oblong, 9–10 × 9–10 mm, wings 3, equal, 3–5 mm wide, locules 3, placenta bilamellate; tepals 5, deep magenta, broadly ovate, more or less isomorphic, 6–7 × 5–6 mm, margin entire, apex slightly acute; styles 3, yellowish, *ca*. 3 mm long, divided to base; stigma yellow, widely Y-shaped, papillose forming a continuous twisted band. Capsules 10–15 × 10–15 mm, glabrous, locules 3, wings equal, rounded proximally and slightly rounded or truncate distally, 4–5 mm wide, thinly fibrous, dehiscing between the locules and wings, pendent on pedicel 9–15 mm long. Seeds barrel-shaped, *ca*. 0.3 × 0.2 mm, collar cells more than half the seed length.

ETYMOLOGY. Named for its locality (Bukit Jugam).

ECOLOGY. Growing on low vertical mudstone cliff faces in a deeply shaded narrow gorge at the headwaters of a small stream at 100 m elevation. Locally common.

DISTRIBUTION. Borneo. Endemic to Sarawak (Bukit Mina Wildlife Corridor in Tatau District).

SPECIMENS EXAMINED—BORNEO. SARAWAK: Tatau District: Bukit Mina Wildlife Corridor — Bukit Jugam, *Julia et al. SFC 4234* (holotype SAR!), *Julia et al. SFC 4245* (SAR).

6. Begonia lambirensis Kiew & S. Julia **sp. nov.**

Close to *Begonia bruneiana* subsp. *bruneiana* Sand (1997: 433) in its habit and non-oblique and narrow leaves but it is different in having shorter internodes, 1–3 cm long (vs. 6–9 cm long in *B. bruneiana* subsp. *bruneiana*), smaller leaves, 7.5–9.5 × 1.5–2.25 cm (vs. 11.5–17 × 3.5–5.5), smaller stipules, *ca*. 5 × 2 mm (vs. 8–15 × 2.5–3 mm), 4 tepals in the female flowers (vs. 5 tepals) and the tepals of the male flowers are distantly toothed (vs. entire). Type: *Julia et al., SFC 3410*, Borneo, Sarawak, Miri District, Lambir Hills National Park, 12 May 2014 (holotype SAR!). **(Fig. 7)**

Erect begonia to 30 cm tall, branching at the base, rooting at nodes. Stems greenish brown, woody, 3–4 mm thick, shortly pubescent, succulent, internodes 1–3 cm long, slightly thicker at nodes. Stipules pale purple (in the purple form) or pale green (in the green form), narrowly lanceolate, *ca*. 5 × 2 mm, margin entire, apex acute, caducous. Leaves alternate, close, held slightly horizontal, not oblique; petioles greenish brown, shortly pubescent, 2–4 mm long,

terete; lamina plain blackish green above, and deep red purple beneath (purple form) or mid-green above and pale green beneath (green form), in life slightly fleshy, slightly glossy, unequally lanceolate, 7.5–9.5 × 2.7–4 cm, broad side 1.5–2.25 cm wide, rounded at base, margin entire at the lower half and finely serrate at upper half, apex acute. Venation pinnate, 4–5 veins on either side of the midrib, concolorous on both surfaces (green form) or reddish on lower surface of purple form, impressed above, prominent beneath. Bracts brownish,

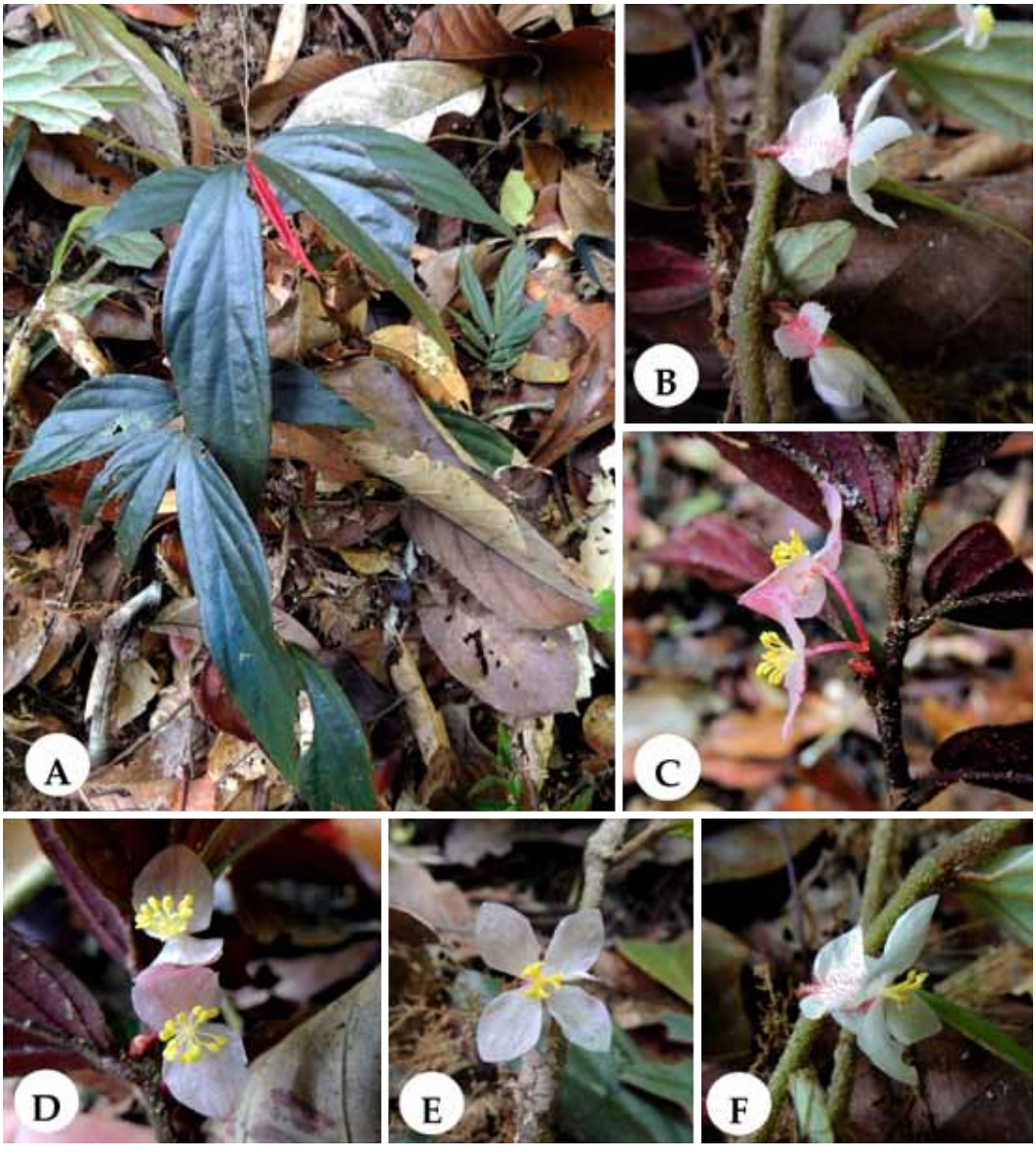

Fig. 7. *Begonia lambirensis*. **A.** Habit; **B.** Female and male inflorescence; **C** & **D.** Opened male flower; **E** & **F.** Opened female flowers. All photos from *SFC 3410* by Julia Sang.

minute, linear, less than 1 mm long, margin entire, caducous. Bracteoles similar but smaller, caducous. Inflorescences protogynous, axillary in the lower leaf axils, female flowers solitary, male inflorescence with a pair of male flowers, peduncle pale pink, *ca*. 4 mm long, glabrous. Male flowers: pedicel pale pink, 3–9 mm long; tepals 2, rounded or ovate, 6–11 × 6–8 m, pale pink or white, glabrous, margin toothed, ciliate, apex rounded or acute; stamens 12–14, spreading and very loose, subsessile; filaments pale yellow, 2–3 mm long; anthers pale yellow, obovate, *ca*. 1 × 0.8 mm, apex emarginate. Female flowers: pedicel pale red, 4–5 mm long; ovary very pale pink, broadly elliptic, 8–10 × 12 mm, wings 3, equal, white, locules 3, placenta 1 per locule; tepals 4, isomorphic, white to pale pinkish, elliptic, 9–10 × 6–7 mm, margin entire, apex slightly acute; styles 3, lemon yellow, *ca*. 4 mm long, divided to base; stigma lemon yellow, wide but shallowly Y-shaped, papillose forming a continuous twisted band. Capsules pinkish with red hairs, turbinate, *ca*. 9 × 12 mm, locules 3, wing equal, 3–4 mm wide, papery, dehiscing between the locules and wings, on erect pedicels 2–4 mm long. Seeds barrel-shaped, *ca*. 0.3 × 0.2 mm, columnar cells more than half the seed length.

ETYMOLOGY. Named for the locality where the species was found.

ECOLOGY. Growing on sandstone cliff faces in pockets of soil in lightly shaded areas.

DISTRIBUTION. Borneo. Endemic to Sarawak (Lambir Hills National Park, Miri District).

SPECIMENS EXAMINED—BORNEO. SARAWAK: Miri District: Lambir Hills National Park, *Julia et al. SFC 3410* (holotype SAR!).

NOTES. The species is so far only known from the type specimen. It occurs in the totally protected area.

7. Begonia linauensis S. Julia **sp. nov.**

Like *Begonia kasutensis* K.G. Pearce (2003: 82) in its low habit and small rounded or sub-orbicular leaves, but it is different in being a low erect begonia (vs. creeping as in *B. kasutensis*), the lamina is glabrous (vs. minutely papillose), shorter inflorescence with a rachis, 3.5–5 cm long (vs. *ca*. 11.5 cm long), larger floral bracts, *ca*. 6 × 6 mm (vs. 4 × 2.5 mm), male flower with 4 tepals (vs. 2 tepals), longer fruit pedicels, *ca*. 1.6 cm long (vs. *ca*. 0.7 cm long) and larger capsule, 1.6–2 × 2–2.5 cm (not *ca*. 1.6 × 1.2 cm). Type: *Julia et al. SFC 576,* Borneo, Sarawak, Belaga District, Bakun, Sungai Linau, Bukit Giham Separang, 13 October 2009 (holotype SAR!). **(Fig. 8)**

Low erect herb to 15 cm tall, branching near the base. Stem dark red, little to much branched, *ca*. 5 mm thick, pubescent, slightly succulent; internodes 2–3 cm long, slightly thicker at nodes. Stipules dark red, glabrous, ovate, *ca*. 10 × 3 mm, margin entire, apex acute, caducous.

Leaves alternate, close, held straight upwards, not oblique; petioles dark red, sparsely hairy, 1–4.5 cm long, slightly grooved above; lamina plain dark green to bronzy above, usually with a silvery or whitish stripe on the midrib, magenta below, in life slightly succulent, glossy, almost rounded or sub-orbicular, symmetrical to slightly asymmetric, 4.5–8.5 × 4.5–7 cm, narrow side 2–3.2 cm wide, base rounded, equal, basal lobe inconspicuously developed, margin shallowly dentate, apex acute or rounded; venation pinnate, 3–4 veins on either side of the midrib, veins glabrous, bronzy and impressed above, magenta and prominent below.

Fig. 8. *Begonia linauensis*. **A.** Habit showing bronzy leaves; **B.** Habit showing bronzy leaves with whitish green stripe on the midrib; **C** & **D.** Male inflorescence; **E.** Male flower; **F.** Female flower; **G.** Cross-section of ovary. Photos **A**, **B** & **G** from *SFC 576* by Julia Sang; Photos **C**–**E** from *Linau 1-83* by Ong Poh Teck; Photo **F** from *Linau 1-83* by Ling Chea Yiing.

Inflorescences protogynous, axillary in the upper leaf axils, a pair of female flowers and many male flowers, male phase cymose, rachis 3.5–5 cm long, peduncle *ca*. 2 cm long. Bracts pale green or dark red, ovate or elliptic, *ca*. 6 × 6 mm, margin entire, apex acute, persistent. Bracteoles similar but smaller, 3–5 pairs arranged more or less in two rows. Male flowers: pedicels dark red, 12–14 mm long; tepals 4, glabrous, margin entire, outer 2 tepals dark red outside, pinkish inside, broadly oval or rounded, 7–8 × 8 mm, apex rounded; inner 2 tepals pinkish, narrowly elliptic, 6–7 × 4 mm, apex acute; stamens 28–35, cluster globose, sessile; filaments pale yellow, *ca*. 2 mm long; anthers pale yellow, obovoid, *ca*. 3 × 1.5 mm, apex emarginate. Female flowers: pedicel dark red, 0.4–1 cm long, glabrous; ovary dark red, broadly obovoid, 0.7–1.2 × 0.4–1 cm long, wings 3, subequal, locules 3, placenta bilamellate with many ovules on both surfaces; tepals 5 (rarely 6), glabrous, margin entire, outer 4 tepals elliptic, 10–12 × 8 mm, dark red outside, pinkish inside apex broadly acute or rounded, the innermost tepals lanceolate, 10–11 × 3–4 mm, pinkish inside and out, sometimes reddish at the centre outside, apex acute, styles 3, pale yellow, *ca*. 2 mm long, divided to base; stigma pale yellow, shallowly Y-shaped, papillose forming a continuous twisted band. Capsules in a pair on the lower rachis, 1.6–2 × 2–2.5 cm, glabrous, locules 3, wing subequal, wing broadly acute proximally and distally, 3–5 mm long, thinly fibrous, dehiscing between the locules and wings, pendent on pedicel *ca*. 1.6 cm long. Seeds barrel-shaped, *ca*. 0.3 × 0.2 mm, columnar cells more than half the seed length.

ETYMOLOGY. Named after Sungai Linau in Belaga District where the specimens were collected.

ECOLOGY. On very rocky steep slopes covered with thick leaf litter.

DISTRIBUTION. Borneo. Endemic to Sarawak (Sungai Linau, Belaga District).

SPECIMENS EXAMINED—BORNEO. SARAWAK: Belaga District: Bakun, Sungai Linau, Bukit Giham Separang, *Julia et al. SFC 576* (holotype SAR!), *Julia et al. Linau 1-83* (SAR).

NOTES. So far the species is only known from the type locality in the area that is affected by the dam. However, the occurrence of the species in similar habitats is not known as no detailed survey was carried out and the area is still not well explored.

8. Begonia roseopunctata Kiew **sp. nov.**

This species most resembles *Begonia murudensis* Merrill (1928: 530) in its habit, leaf size and shape particularly in the narrowly attenuate apex and sub-orbicular capsule but it differs in its small stipules *ca*. 2 mm long (vs. *ca*. 20 mm long as in *B. murudensis*), *ca*. 5

veins radiating from the base of the petioles (vs. 7–9 veins), the longer inflorescence with a peduncle, 3.5–5 cm long (vs. *ca*. 2.5 cm long), smaller male flowers with 4 tepals, 5–6 mm long (vs. male flowers with 2 tepals, *ca*. 20 mm long) and smaller capsules, (8–)10–12 × (4–)12–15 mm (vs. *ca*. 30 × 40 mm). Type: *Kiew et al. S 93271*, Borneo, Sarawak, Simunjan District, Gunung Gaharu, 8 August 2004 (holotype SAR!). **(Fig. 9)**

Erect or low climbing begonia, whole plant glabrous. Stems 15–30 cm long, branching, rooting at nodes and climbing vertically up rock faces, young stems deep red, becoming brown and woody at the base, slender, 4–6 mm thick; internodes 5–7.5 cm long. Stipules deep red, narrowly lanceolate, *ca*. 6 × 2 mm, margin entire, persistent. Leaves distant, held more-or-less horizontally, oblique; petioles deep red, 1.5–2.2 cm long, succulent; lamina of young plants pale green with candy pink spots between veins, leaves of older plants have white spots that coalesce, and leaves of mature flowering plants are plain mid-green, pale green beneath, thinly succulent, drying papery, asymmetric, broadly lanceolate, 10.5–13.5 × 9–9.5 cm, broad side 6.5–7 cm long, base unequal, basal lobe *ca*. 10 mm long, margin dentate, apex acuminate; venation palmate-pinnate with 2 pairs at the base and 1 veins on either side of the midrib, branching towards the margin, concolorous, slightly impressed above, prominent beneath. Inflorescences protogynous, axillary, cymose, (5–)7–13 cm long, peduncle 3.5–5 cm long, female flowers 1–2 on a short branch at the base, 7–9 cm long, upper branches 7–9 cm long with many clustered male flowers. Bracts pale reddish green, lanceolate, *ca*. 4 × 2 mm, margin entire, apex acuminate, acumen to 1 mm long; bracteoles similar but smaller. Male flowers: buds green, pedicels pale red or greenish, 3–7 mm long; tepals 4, pale yellowish green, margin entire, apex rounded, outer 2 tepals oval, 4–6 × 4–5 mm, inner 2 tepals narrowly oval or elliptic, 4–5 × 2 mm, stamens *ca*. 26, cluster globose, sessile, filaments 0.5–1 mm long, anthers pale yellow, narrowly obovate, *ca*. 1 mm long, apex emarginated. Female flowers: pedicels 8–15 mm long, ovary reddish green or pale green, 6–8 × 5–10 mm, wings 3, more or less equal, 5–6 mm wide, locules 3, placenta bilamellate, tepals 5, pale green or yellowish green, outer 4 tepals isomorphic, elliptic or oblong, 6–10 × 3–6 mm , margin entire, apex acute, inner tepal smaller, narrowly elliptic, 4–8 × 3–4 mm, styles 3, red or yellow, 2–3 mm long; stigma brownish, shallowly Y-shaped, papillose forming a continuous twisted band. Capsules pale green, (8–)10–12 × (4–)12–15 mm, locules 3, wings 3, equal, rounded proximally, slightly extended distally, 3.5–4.5 mm wide, dehiscing between the locules and wings, pendent on a stiff pedicel, *ca*. 12–15 mm long. Seeds barrel-shaped, *ca*. 0.4 × 0.2 mm, collar cells more than half the seed length.

ETYMOLOGY. Latin, *roseo* = rosy + *punctata* = spots, referring to the conspicuous variegation of the leaves of young plants.

ECOLOGY. Lowland mixed dipterocarp forest below 500 m elevation, on rocky sandstone slopes in deeply shaded areas.

DISTRIBUTION. Borneo. Endemic to Sarawak (Gunung Gaharu).

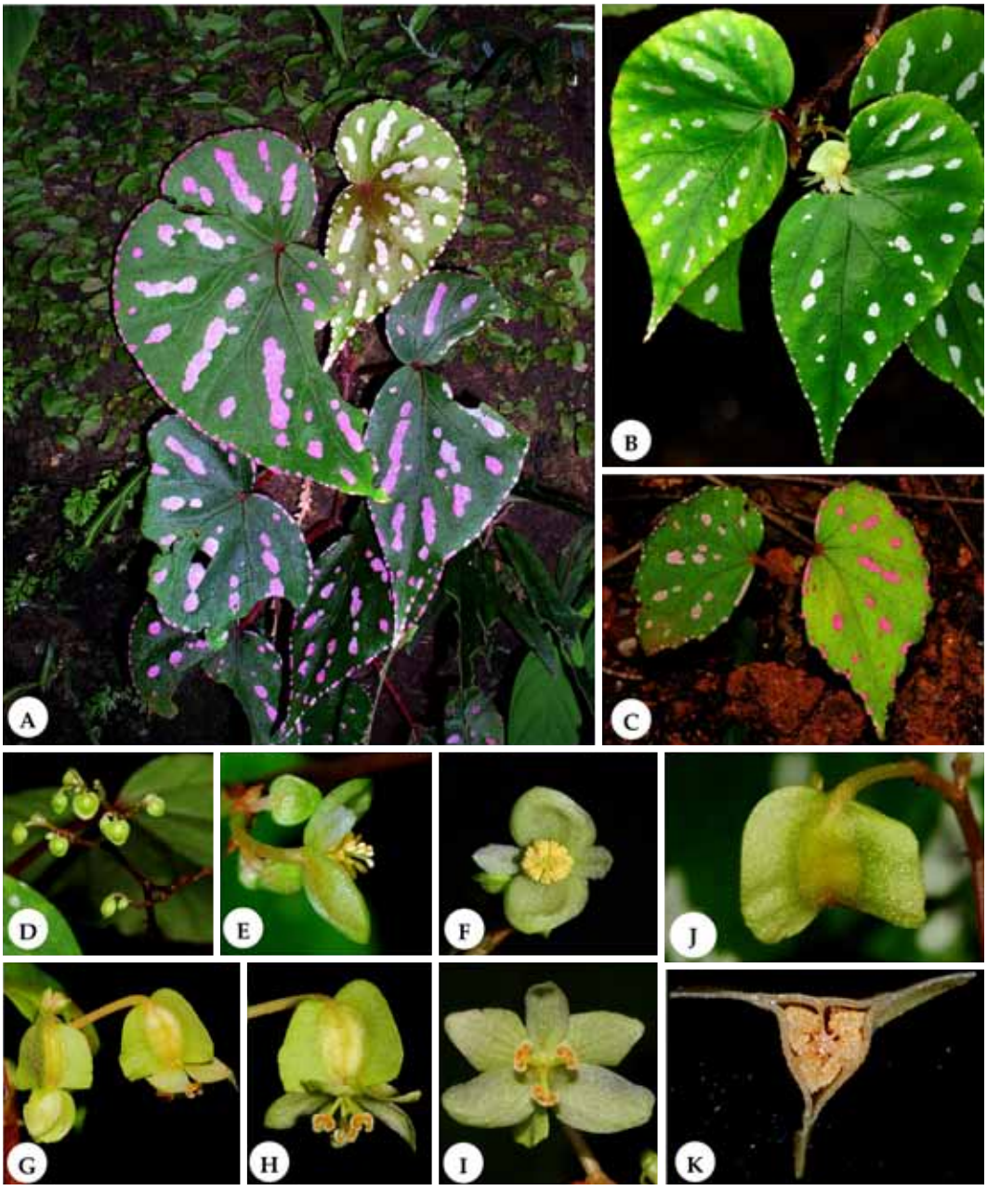

Fig. 9. *Begonia roseopunctata*. **A.** Habit; **B.** Leaves of adult plant with white spots; **C.** Leaves of juvenile plant with pink spots; **D.** Male inflorescence; **E** & **F.** Male flowers; **G.** Female inflorescence; **H** & **I.** Female flower; **J.** Fruit; **K.** Cross section of fruit. Photo **A** from *S 93271* by Julia Sang; Photos **B**–**K** from *JS 5184* by Julia Sang.

SPECIMENS EXAMINED—BORNEO. SARAWAK: Simunjan District: specimen from live plant grown in Nursery at Semengoh NR originally collected from Gunung Gaharu, *Julia JS 5184* (SAR); Gunung Gaharu, *Kiew et al. S 93271* (holotype SAR!).

NOTES. The species was discovered by Peter C. Boyce from Gunung Gaharu, Sarawak. The striking character is the bright pink spots on juvenile plants that unfortunately, turn white and eventually disappear completely in mature plants. This is a common phenomenon in other plants with spotted leaves. The only known locality is located outside the totally protected area on Gunung Gaharu and is subject to forest exploitation. The plant is currently grown in the nursery at Semengoh NR.

9. Begonia setiamensis S. Julia & Kiew **sp. nov.**

Like *Begonia sarangica* Kiew & S. Julia (2009: 369) in its habit and parallel veins but it differs in having longer stipules, 20–25 cm long (vs. *ca.* 17 cm long as in *B. sarangica*), longer pedicels on the female flower, *ca.* 6 mm (vs. 2–4 mm), larger ovary, *ca.* 26 × 14 mm (vs. 13–17 × 9–11 mm) and longer fruit, 2.8–3.2 cm long (vs. 1.7–2.3 cm long). Type: *Julia et al. SFC 4217*, Borneo, Sarawak, Tatau District, Bukit Setiam, 11 July 2014 (holotype SAR!). **(Fig. 10)**

Erect begonia to 60 cm tall, flowering at 22 cm tall. Stem little-branched, reddish brown, 6–8 mm diameter, covered with soft white hairs, internodes 2.5–7.5 cm long, slightly swollen at the nodes. Stipules pale green, covered with soft white hairs, narrowly lanceolate, 20–25 × 6–10 mm wide, margin entire, apex acute, caducous. Leaves alternate, slightly close, held horizontally, slightly oblique; petioles reddish brown, covered with dense soft white hairs, 17–25 cm long, 3.5–4.5 mm thick, terete; lamina plain dark green above, slightly paler below, asymmetric, stiff or in life appearing fleshy, glossy, broadly ovate, 17–17.5 × 10–12.5 cm, broad side 7–8 cm wide, base rounded, basal lobes 2.5–2.8 cm long, margin uniformly crenate or shallowly dentate, apex acuminate, acumen to 2 cm long; venation palmate-pinnate, 4–5 pairs on either side of the midrib, 3–4 veins in basal lobe, branching twice, veins red brown at the base on upper surface, otherwise green, impressed above, prominent beneath. Inflorescences protogynous, axillary in upper leaf axils, compact, pale green, racemose, rachis *ca.* 2.5 cm long, peduncle 0.7–1.2 cm long. Bracts pale green, in pairs, lanceolate, margin entire, caducous, 15–16 × 7–11 mm, sheathing the male flowers, diminishing size towards apex, margin entire, caducous. Bracteoles similar to bracts but slightly smaller, 9–10 × 6 mm. Male flowers (unopened): pedicels pale green, 2–4 mm long; tepals 2, greenish white, reddish towards the pedicel, hairy outside, elliptic, *ca.* 5 × 2, margin entire, apex broadly acute; stamens *ca.* 23, cluster globose, sessile; filaments pale yellow, *ca.* 0.5 mm; anthers pale yellow, oblong, *ca.* 1 × 0.6 mm, apex emarginate. Female flowers: pedicels pale green, *ca.* 6 mm long, pubescent; ovary pale green, oblong, *ca.* 26 × 14 mm, wings *ca.* 4.5 mm wide, equal, locules 3, bilamellate; tepals 5, pale yellowish green,

elliptic, outer tepals 10–13 × 6–7 mm, margin toothed towards apex, apex acute; inner tepals broadly elliptic, *ca*. 7 × 5 mm, margin toothed towards apex, apex broadly acute; styles pale yellow, *ca*. 5 mm long, divided to base; stigma pale yellow, with wide base, papillose forming a continuous twisted band. Capsules 1–2 per infructescence, oblong, 28–32 × 17 mm, pubescent, locules 3, wing equal, *ca*. 5 mm wide, rounded proximally, truncate distally, dehiscing between the locules and wings, ripening under the leaf on a stiff pedicel, *ca*. 7 mm long. Seeds barrel-shaped, *ca*. 0.3 × 0.2 mm, collar cells more than half the seed length.

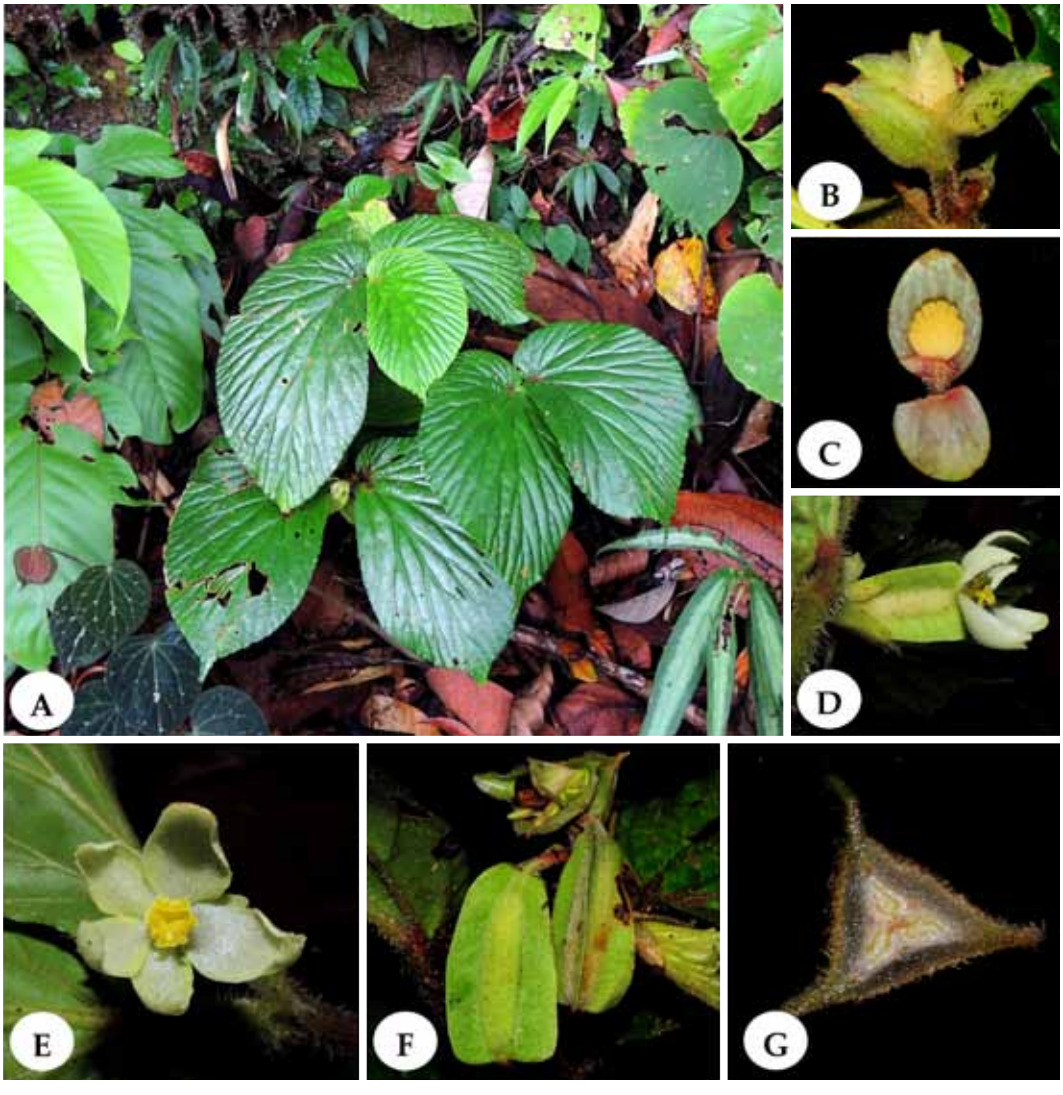

Fig. 10. *Begonia setiamensis*. **A.** Habit; **B.** Floral bracts and bracteoles; **C.** Male flower; **D** & **E.** Female flower; **F.** Fruit; **G.** Cross-section of capsule. All photos from *SFC 4217* by Ling Chea Yiing.

ETYMOLOGY. Named for its locality, Bukit Setiam, where the species was first collected.

ECOLOGY. In lowland mixed dipterocarp forest at elevations below 100 m. Growing near a waterfall in a consistently humid and wet area, on a thin layer of moss on wet rock surface and also on thick layers of leaf litter.

DISTRIBUTION. Borneo. Endemic to Sarawak (Bintulu District).

SPECIMENS EXAMINED—BORNEO. SARAWAK: Bintulu District: Bukit Setiam, *Julia et al. SFC 4217* (holotype SAR!), *Julia et al. SFC 4225* (SAR); Bukit Mina Wildlife Corridor, Bukit Mina, *Julia et al. SFC 4243* (SAR).

NOTES. Two colour forms were observed in the field: (i) population at Bukit Setiam that had white pubescence on the fruit, pedicel, bracts etc.; (ii) the population at Bukit Mina where plants had red pubescence on fruit, pedicel, bracts etc.

10. Begonia sirukitii S. Julia & C.Y. Ling **sp. nov.**

Similar to *Begonia roseopunctata* in its spotted and oblique leaves but it is different in its longer stipules, *ca*. 12 × 3 mm (vs. *ca*. 6 × 2 mm as in *B. roseopunctata*), longer petioles, 5.5–9 cm long (vs. 1.5–2.2 cm long), larger leaves, 17–30(–60) × 12–16(–30) cm (vs. 10.5–13.5 × 9–9.5 cm), longer inflorescences, 19–24 cm long (vs. 5–13 cm long), female flowers with shorter pedicel, *ca*. 6 mm long (vs. 8–15 mm long), larger ovary, *ca*. 16 × 10 mm (vs. *ca*. 6–8 × 5–10 mm), tepals of female flowers 4 (vs. tepals 5), tepals of male flowers 2 (vs. tepals 4) and larger fruit, *ca*. 20 × 16 mm (vs. *ca*. 8–12 × 4–15 mm). Type: *Ling et al., SFC 2245*, Borneo, Sarawak, Belaga district, Bakun Dam, Ulu Sungai Linau, Sungai Anyah, 16 May 2011 (holotype SAR!). **(Fig. 11)**

Erect cane-like begonia, 11–75 cm tall. Stems, little-branched, reddish brown or dark green, becoming woody on old plants, 4–6 mm thick, internodes 3–8 cm long, thicker at nodes. Stipules greenish yellow, lanceolate, *ca*. 12 × 3 mm, margin entire, apex acute, caducous. Leaves alternate, distant, held vertically, oblique; petioles reddish or dark green, reddish brown near the base, 5.5–9 cm long, glabrous, grooved above; lamina green with scattered and irregular sized white spots between the veins on upper leaf surface, the spots sometimes pinkish on juvenile plants, paler below, in life fleshy, glossy above, asymmetric, broadly ovate, 17–30(–60) × 12–16(–30) cm, narrow side 5–6 cm wide, base cordate, sometimes slightly overlapping, basal lobe 3–4 cm long, margin whitish, entire or shallowly toothed, apex acuminate, acumen 1–2 cm long; venation pinnate 3–4 veins on either side of the midrib, 4–5 in basal lobe, concolorous, sunken above, prominent beneath. Inflorescences protogynous, axillary in the uppermost leaf axils, 19–24 cm long, paniculate, producing 1–2 pairs of female flowers at the base and many male flowers above. Bracts pale green,

lanceolate, 15–18 × 4 mm, strongly keeled, margin entire, apex setose, seta to 2 mm long, caducous. Bracteoles pale green, lanceolate, *ca*. 10 × 3 mm, margin entire, caducous. Male flowers: pedicel red brown or reddish, 2–3 mm long; tepals 2, oval, *ca*. 5 × 3 mm, reddish to pinkish or reddish with greenish margin, glabrous, margin entire, apex acute; stamens 19–23, cluster conical, subsessile; filaments pale yellow, *ca*. 1 mm long; anthers pale yellow, obovoid, 1–1.5 × 0.5–1 mm, apex emarginate. Female flowers: pedicel red to pale red, *ca*. 6 mm long; ovary greenish, glabrous, oblong, *ca*. 16 × 10 mm, wings 3 with ridge between two of the wings, equal, locules 3, placenta bilamellate with many ovules on both surfaces; tepals 4, pinkish, narrowly ovate, more or less isomorphic, *ca*. 8 × 5 mm, margin toothed on the upper half, apex acute; styles 4, pale yellow, *ca*. 3 mm long, divided to base; stigma yellowish, widely Y-shaped, papillose forming a continuous twisted band. Capsules in pairs,

Fig. 11. *Begonia sirukitii*. **A.** Habit; **B.** Juvenile plant; **C.** Floral bracts and bracteoles; **D.** Male flower; **E.** Male flower; **F.** Fruit. All photos from *SFC 2245* by Ling Chea Yiing.

oblong, *ca*. 2 × 1.6 cm, glabrous, locules 3, wings equal, acute proximally, acute or truncate distally, 4–6 mm wide, thinly fibrous, dehiscing between the locules and wings, pendent on pedicels 1–2.5 cm long. Seeds barrel-shaped, *ca*. 0.3 × 0.1 mm, columnar cells more than half the seed length.

ETYMOLOGY. Named after Sirukit anak Dubod, field assistant at Sarawak Forestry Corporation (2005–present) who has a very good eye for begonias in the field.

ECOLOGY. Growing on rocky cliffs, near riverbanks or waterfalls and on steep to gentle earth slopes in semi-shaded area at 120 m elevation.

DISTRIBUTION. Borneo. Endemic to Sarawak (Belaga area).

SPECIMENS EXAMINED—BORNEO. SARAWAK: Belaga District: Bakun Dam — Ulu Sungai Linau, Sg. Jakah, *Ling et al. SFC 2231* (SAR), Sungai Anyah, *Ling et al. SFC 2245* (holotype SAR!); Ulu Sungai Balui, Sungai Pahak, *Ling et al. Balui 2-154* (SAR).

NOTES. The largest leaf observed in the field can reach *ca*. 60 × 30 cm.

DISCUSSION

All the begonias species described in this paper have narrow distributions. Six out of ten species are currently known only from a single locality while the other four species were collected from two or three localities in Sarawak. The ten species described here are just the tip of the iceberg because Julia and Kiew (2014) have estimated that there are at least 600 species in Borneo of which at the present time only about 190 are named. From our survey of specimens in the SAR herbarium, there are at least another 110 unnamed species, not to mention the many more awaiting discovery in Sarawak forest (Julia & Kiew, 2014).

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